

ON THE MOLLUSCAN GENUS *PARYPHANTA* AND ON THE ANATOMY OF *P. HOCHSTETTERI*, Pfr.

By Lieut.-Colonel H. H. GODWIN-AUSTEN, F.R.S., etc.

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PLATE I.

THROUGH the kindness of Mr. S. J. Da Costa, I have been enabled to examine the animal of *Helix Hochstetteri*, sent to him from New Zealand in spirit; he placed in my hands two specimens which had been extracted from the shells, so that a portion of the animal was lost in both cases and I am unable to give a complete drawing of the generative organs, but as the missing portion consists of the hermaphrodite gland and duct with the albumen gland it is not of so much importance; the same remark also applies to the alimentary canal and neighbouring parts.

This species is very closely allied to the type of the genus *Paryphanta*, founded by Albers,¹ who included in it 14 species; of these only two can now be retained, viz., *P. Busbyi*, Gray (1841), which is fortunately quoted as the type, and *P. Milligana*, Pfr. (1852); to these Professor F. W. Hutton in an excellent paper on New Zealand Land Mollusca² added *P. Hochstetteri*, Pfr. (1861), and *P. Gilliesii*, Smith (1880), four species in all. Of the remaining twelve species originally placed in the genus, one, *P. urnula*, Pfr., has been transferred to *Rhytida* on the authority of Hutton; two species, *P. coresia*, Gray, and *P. Jeffrey-siana*, Pfr., pass into his new genus *Eleca*, (1883)²; another, *P. obnubila*, Reeve, goes to *Thalassia*; whilst *P. splendidula*, Pfr., a very different form, which I only know from Sowerby's drawing,³ apparently not from New Zealand but from Torres Straits, must be placed in some other genus together perhaps with another species, *P. atramentaria*, foreign to New Zealand and coming from Victoria. One species, *P. lambda*, Pfr., is the same as *P. obnubila* mentioned above, and the remaining five species, viz.:— *P. omega*, Pfr. = *P. compressisolata*, Reeve (1852), *chiron*, Gray, *crebriflammis*, Pfr., *phlogophora*, Pfr., and *rapida*, Pfr., have been placed by Hutton in *Amphidoxa*, but on what grounds is not clearly shewn.

Amphidoxa was founded by Albers,⁴ the type being *Helix marmorata*, Pfr., with a second closely allied species, *Amphidoxa helicophantoides*, Pfr., both from Juan Fernandez. They are figured by Sowerby in the *Conchologia Iconica*, Pl. exiii., and both are obliquely streaked, being thus similar to *Helix zebra*, Guillon (1842) = *phlogophora*, Pfr., 1849 = *flammigera*, Pfr. (1852) = *multilimbata*, Hombron and Jacquinot (1854); similar markings distinguish *Amphidoxa chiron*, Gray, and *A. crebriflammis*, Pfr. This character,

¹ "Die Heliceen," 2nd ed. 1860, p. 48.

² Trans. New Zealand Inst. xvi., p. 207.

³ Reeve "Conch. Icon." *Helix* Pl. cl., No. 973.

⁴ "Die Heliceen," 1860, 2nd ed., p. 82.

combined with the general form and size, probably lead Hutton to consider the genus a New Zealand one. I should, however, unless the anatomical characters have been proved to be the same, hesitate to do so, and the extended range of this genus must be received with great doubt considering the enormous distance between the two islands.

Helix zebra=*phlogophora* is, as I have mentioned before, placed in *Paryphanta* by Albers and is retained in that genus by Hutton in his paper,¹ and described as having a mucous gland. In his revision of the Land Mollusca of New Zealand,² it is placed in *Amphidoxa*. If the character of the mucous gland be correctly given it must be placed in some other genus, for no other species included under *Amphidoxa* is described as possessing this character. The jaw moreover is smooth (see Hutton's figure on Pl. xi. fig. P.), and in this respect and in the drawing of the radula (Pl. ix. fig. Z.) the dentition is nearer the type of the Indo-Malay species of the Zonitidæ than any of the other lingual ribbons, figured by Hutton, of New Zealand land shells.

Description.—Animal when alive apparently very dark indigo grey; (*Busbyi* is described as "dark blue black"). There is no sign of a mucous pore. The foot below is pale grey and is much wrinkled into folds directed centrally to where the powerful retractor muscles have their attachment (Fig. 2 and 3), it is produced, and narrows rapidly, in front, broad and rounded behind, and it evidently can be very widely and laterally extended in life, so as to be oval in form, which is still its character in the spirit specimen. There is no central area. The foot is striated above (Fig. 4) by fine equidistant grooves, united by finer cross lines: the first terminate in a narrow pallial groove running parallel to the edge of the foot.

There are no mantle lobes, though the mantle (Fig. 1) is no doubt recurved over the edge of the peristome in life. The neck lappets or lobes are small, the right simple, the left in two lobes, one next the respiratory orifice, the other tongue shaped on the posterior side, and in this respect it resembles *Helix* (*Rhysota*), *Brookei*, from Borneo. The buccal mass (Figs. 5 and 7) is very large, about 32 mm. long in its contracted state, it is cylindrical bent round downwards and again forwards at the posterior end, broad side muscles keeping it in this position; the muscular attachments are very strong. The sides of the buccal mass have a thin, somewhat horny covering, through which in front the radula can be detected, the anterior side muscles pass through this outer covering and are attached to the lingual cartilage just at the point where the radula first emerges from the central sheath in which it is developed. The odontophore, when the mouth is cut away, shews the radula contracted into an oval U-like form (Fig. 8) and turned back from the inside lapping over to the outside of the long lingual cartilages, which further back enclose the muscular sheath (m.s. Fig. 9) in which the radula takes its rise. The onto-

¹ "Notes on New Zealand Land Shells." Trans. New Zealand Inst. xvi. p. 170.

² *l.c.* p. 198.

phore thus differs considerably from the globose form usually seen in other genera.

There is no jaw, the area occupied by it in other forms being very muscular and highly contractile in a crenulate manner all round. This form of mouth would give the animal the power of first adjustability, and secondly retention on contraction. At the same time the elongate form of the odontophore points to its being capable of protrusion far forward; these characters with the great size and strength of the muscular buccal mass are quite in unison with its carnivorous habits. The widely spreading foot would also have a great power of adherence to any surface, and also of enveloping the stalk on which it was climbing.

The radula is broad and long ($67 \times 1 \times 67$), the rows forming an acute angle directed backwards.

The centre tooth is small (Fig. 6), half the size of the following admedian teeth, and is short and straight sided. The median teeth are long aculeate, flatter on the inner than on the outer side, the points slightly bending inwards like those of swords; there is a gradual transition to the outermost laterals, no marked change of form occurring, the teeth getting shorter until of a triangular shape.

The nervous system is well shown, throwing off nerves to every part of the foot. A very large salivary gland of thick elongate shape extends centrally to that part of the foot where the principal muscles are attached.

The generative aperture is in the usual position. The male organ (Figs. 10, 11, 12) is elongate, simple, with the retractor muscle at the very end. The *vas deferens* is short and unites with it very low down, not far from the generative aperture; it is convoluted for nearly its whole length and lies close to the side of the oviduct.¹ The spermatheca (Fig. 13) is moderately short and pear shaped.

The male organ being of a dark colour, like the eye tentacles, it may at first sight be taken for one of them, but the greater size soon distinguishes it. For about half way up, or 17 mm., to above the junction of the *vas deferens*, the sheath forms a tube, with sides having long parallel ridges; here there is a blunt knob (Fig. 12) with little nipple-like crenulations round it; the posterior portion is thence solid and muscular.

While examining this species I received a very interesting paper² from the author, Mr. C. Hedley, wherein he describes and figures

¹ This peculiarity is also to be seen in *Testacella*, a specimen of which as a jawless land mollusc I dissected at the same time as *Paryphanta*. My specimen came from Gloucestershire and I took it to be *T. haliotidea*. This shews a close convolution of the *vas deferens* for a short distance, and just where it first becomes a free tube. Mr. W. E. Collinge, in a paper (Annals and Mag. Nat. History July, 1893) I have received since reading this communication, alludes to this curious distinction in *T. maugoi*, Fer., and gives a drawing of it, Pl. i., fig. 3, and to him is due the credit of first calling attention to this curious divergency of character and one which I have never met with in any other group.

² "*Schizoglossa*; a new genus of carnivorous snails," Proc. Linn. Soc. New South Wales, ser. ii., vii., pp. 387-92.

the animal of *Daudebardia Novoseelandica*, shews its affinities are with *Paryphanta*, although slug-like in form; he also points out how it differs from the European genus *Testacella*, and he has rightly constituted a new genus, *Schizoglossa*, for its reception. In the form of the buccal mass this new sub-genus shews best the close relationship which it has with *Paryphanta*, both in the rounded form of the basal end and in the unification of the salivary glands (Fig. 5), neither of which characters are to be seen in *Testacella haliotidea* (from Gloucestershire), which I have examined. For in this latter species the buccal mass (Fig. 14) is cylindrical elongate and pointed, merging into the strong muscles that are attached to the apex of the little sub-spiral shell (Fig. 15); while the salivary glands are quite separate from one another and lie on either side of the oesophagus.

In the generative organs (Fig. 16) we find this difference. The *vas deferens* in *Testacella* joins the male organ near the attachment of the retractor muscle at the posterior end, whereas in *Paryphanta* and *Schizoglossa* it is peculiarly short and joins the male organ very low down just above the generative aperture (Figs. 10, 11). Mr. Hedley well expresses it thus: "Their external appearance is quite suggestive of the European carnivores *Daudebardia* and *Testacella*; the rudimentary shell quaintly perched on the creature's tail, the auriform shape of that shell and the aculeate teeth of the radula all combine to present a strong, but I am persuaded a superficial and misleading likeness to their antipodean representatives. Closer examination detects differences in every detail." The exact position of the point of attachment to the epidermal envelope of the retractor muscles of such organs as the eye, generative organs, etc., is, I consider, of very great importance when studying the differences between generic groups, being an internal character less liable to change than other external ones. I may mention here that in *Testacella* the right eye tentacle has its retractor muscle situated on the base of the foot near the right posterior margin, while that of the left eye tentacle is attached to the upper surface of the body cavity on the left hand side, just in front of the margin of the shell.

There is one New Zealand species, however, which does require a closer and more detailed examination, and that is *Testacella vagans*, so that it may be compared in all its organs with *Testacella* of the Northern Hemisphere. The teeth of the radula are shown by Hutton to be barbed at the tip, and the centrals are small, in which respect they resemble the European species, as also in the divided foot, but the mantle parted into numerous lobes is a departure. I hope Mr. Hedley will be able to get hold of this species and give us a good account of it. The three Nearctic genera of the section AGNATHA, viz., *Paryphanta*, *Ælea* and *Schizoglossa*, I would propose placing in a sub-family under the title of PARYPHANTINÆ, *Schizoglossa* bearing the same relationship to *Paryphanta* as *Girasia*, Grey, does to *Macrochlamys* among the Zonitidæ. Whether the development has been from the

¹ *l.c.* p. 388.

